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In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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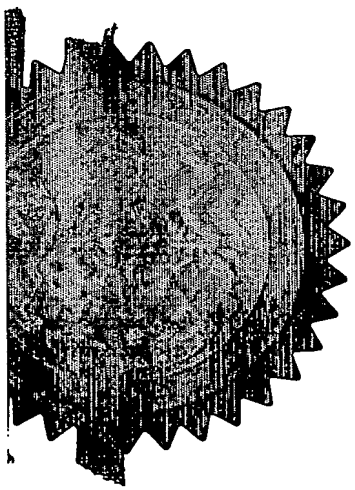

Signed Andrew Gersey

Dated 17 April 2003

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Patents Form 1/77
Patents Act 1977
(Rule 16)

THE PATENT OFFICE
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The Patent Office

1/77

Request for grant of a patent

6 MAR 2002

The Patent Office
Cardiff Road
Newport
Gwent NP9 1RH

1. Your Reference

47/64056GB

2. Patent Application Number

0205252.0

3. Full name, address and postcode of the or of each applicant (*underline all surnames*)

Stolt Offshore Limited
Bucksburn House, Howes Road
Bucksburn
Aberdeen
AB16 7QU

Patents ADP number (*if known*)

7890262001

If the applicant is a corporate body, give the country/state of its incorporation

United Kingdom

4. Title of the invention

Method and Apparatus for Deploying Articles Deep Waters

5. Name of Agent

FITZPATRICKS

"Address for Service" in the United Kingdom to which all correspondence should be sent

4 West Regent Street
Glasgow
G2 1RS

Patents ADP number

00000695002

6. Priority Details

Country	Priority Application Number	Date of filing

7. If this application is divided or otherwise derived from an earlier UK application give details

Number of earlier application	Date of filing

8. Is a statement of inventorship and or right to grant of a patent required in support of this request?:

YES

Patents form 1/77

9. Enter the number of sheets for any of the following items you are filing with the form.

Continuation Sheet for this form

Description	4
Claims	0
Abstract	0
Drawings	4

10. If you are also filing any of the following state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a Patent (*Patents Form 7/77*)

Request for Preliminary examination and search (*Patents form 9/77*)

Request for Substantive Examination (*Patents Form 10/77*)

11. I/We request the grant of a patent on the basis of this application

Signature _____ Date: 6 March 2002

FITZPATRICKS

12. Name and daytime telephone number of person to contact in the United Kingdom

John J Gray
0141 306 9000

METHOD AND APPARATUS FOR DEPLOYING ARTICLES IN DEEP WATERS

INTRODUCTION

The invention relates to methods and apparatuses for deploying articles to great depth beneath the sea surface, for example to the seabed in deep waters.

Cranes and winches employing wire rope have been used to deploy loads to the seabed in modest water depth for many years. Some of these cranes and winch systems are fitted with, or used in conjunction with, heave compensators, which take-up and pay out the rope dynamically, to compensate vertical motion (heave) of the ship, barge or other platform from which the rope is supported.

As water depth increases, the weight of wire needed to lower equipment to the seabed increases until it becomes such a significant part of the total load that the method becomes impractical. Man made fibre rope can be almost neutrally buoyant and have strength and elastic characteristics similar to wire rope and is therefore potentially a suitable replacement for wire. Man made fibre rope, however, has a poor tolerance to the fatigue induced by bend cycling under load, and is thus unsuitable for use with current winch designs, particularly but not only those having heave compensation.

The present invention aims to provide novel methods and apparatus for using fibre rope, when deploying loads from a vessel at sea. A particular object for at least some embodiments of the invention is to provide methods that reduce bend cycling of the rope under load. A further aim is to allow operations to depths exceeding 300m or 1000m.

In broad terms, in one aspect of the invention a tensioning device mounted substantially vertically is used to grip the fibre rope, supporting the load and facilitating the payout of the rope.

The tensioning device may in particular be a continuous track system (linear winch) and can be made up from multiple units mounted around the fibre rope.

Substantially the entire load in the fibre rope is taken by the tensioning system; the rope entering the tensioning system is not under substantial load. This allows the fibre rope to be stored on a storage reel or carousel without bending under load. Of course some back-tension may be maintained on the reel for control of the rope.

The tensioning device may have a general form and features in common with track-type tensioners used conventionally for pipe laying operations. In preferred embodiments, however, at least the shoes of the tensioner are specially adapted to the different characteristics of the fibre rope, and would not be suitable for smooth conduit.

Three specific adaptations of tensioner are described below, by way of example only. These may be used individually or in any combination, and the invention does not exclude other adaptations, nor the use of an existing pipelay tensioner.

The tensioner may be mounted so as to suspend the rope from beside the vessel, or via a moonpool. A tower arrangement for vertical deployment of flexible conduit through a moonpool is known for example from WO 91/15699 A (Coflexip). As is also known in the pipe laying art, vertical or steeply inclined towers of other constructions can be applied. "Vertical" in the present context is intended to encompass a range of deviation from the vertical, particularly (i) the load for whatever reason acts in a direction inclined from the vertical (in which case the tensioner may be tilted to aligned with the load direction) and (ii) where fatigue under bend cycling is serious only beyond a certain bend angle. An offset tower permitting pipelay with an inclined tensioner is known for example from WO --/---- A (PCT/GB02/00200 – agent's ref 63706WO), not published at the present priority date.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described, by way of example only, by reference to the accompanying drawings, in which:

Figure 1 is a schematic diagram illustrating the general arrangement of a rope-based lifting and lowering apparatus including a vertical tensioner according to an embodiment the present invention;

Figures 2, 3 and 4 show schematically three specific adaptations of the tensioner within the apparatus of Figure 1.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

Figure 1 provides an overview of the deployment system which is used to lower a load 10 to the seabed from a ship, barge or other sea-borne vessel 12. Fibre rope 14 is stored in a spooling system 16, which does not serve as a winch for the weight of the load 10, however. A continuous track tensioner 18 engages the rope 16 by friction and or other means and provides the tension for controlled lowering or lifting of the load.

Tracks or the like arrayed around the axis of the rope 14 are pressed radially inward by suitable rams, levers and the like to grip the rope, and to release it again when required.

The detailed construction and operation of the structures for supporting these tensioners in vertical and/or inclined positions above the sea surface can be readily envisaged by the skilled person, for example by reference to prior art in the field of pipe and cable laying, including those documents mentioned already above.

Three possibilities have been considered for adapting the tensioner specifically for gripping of the fibre rope.

Figure 2 shows a first adaptation of the tensioner gripping pads 200 which are made deformable. The deformation under radial pressure accommodates for example the

braided surface variations of the rope, while also engaging them to assist in transferring tension from the rope to the hoist.

Figure 3 shows another adaptation in which the arrays of gripping elements 300 and 302 of the tensioner on opposite sides of the rope axis are staggered so as to induce snaking of the rope 14 under radial gripping pressure.

Figure 4 shows another adaptation, in which stoppers 400 are embedded in the rope 14 at intervals along its length. The rope may be gripped by elements 402 of the tensioner 18 having corresponding spacing.

The above adaptations are provided by way of example only, and the skilled reader will appreciate that other arrangements are possible within the spirit and scope of the invention. In particular, it will be noted that the adaptations of Figures 2, 3 and 4 can be used alone or in combination. Thus, for example, gripping elements 300, 302 and 402 of Figures 3 and 4 can be made deformable in the manner of Figure 2. Similarly, elements 400 and 402 of the Figure 4 arrangement can be provided in staggered arrays, for example at right angles to one another about the rope axis.

The method can be applied beneficially in oil & gas field development (sub-sea construction) in depths beyond 300m. General lifting and lowering operations can also be envisaged in depths down to full oceanic depth, for example for Salvage, Oceanography, and Military purposes.

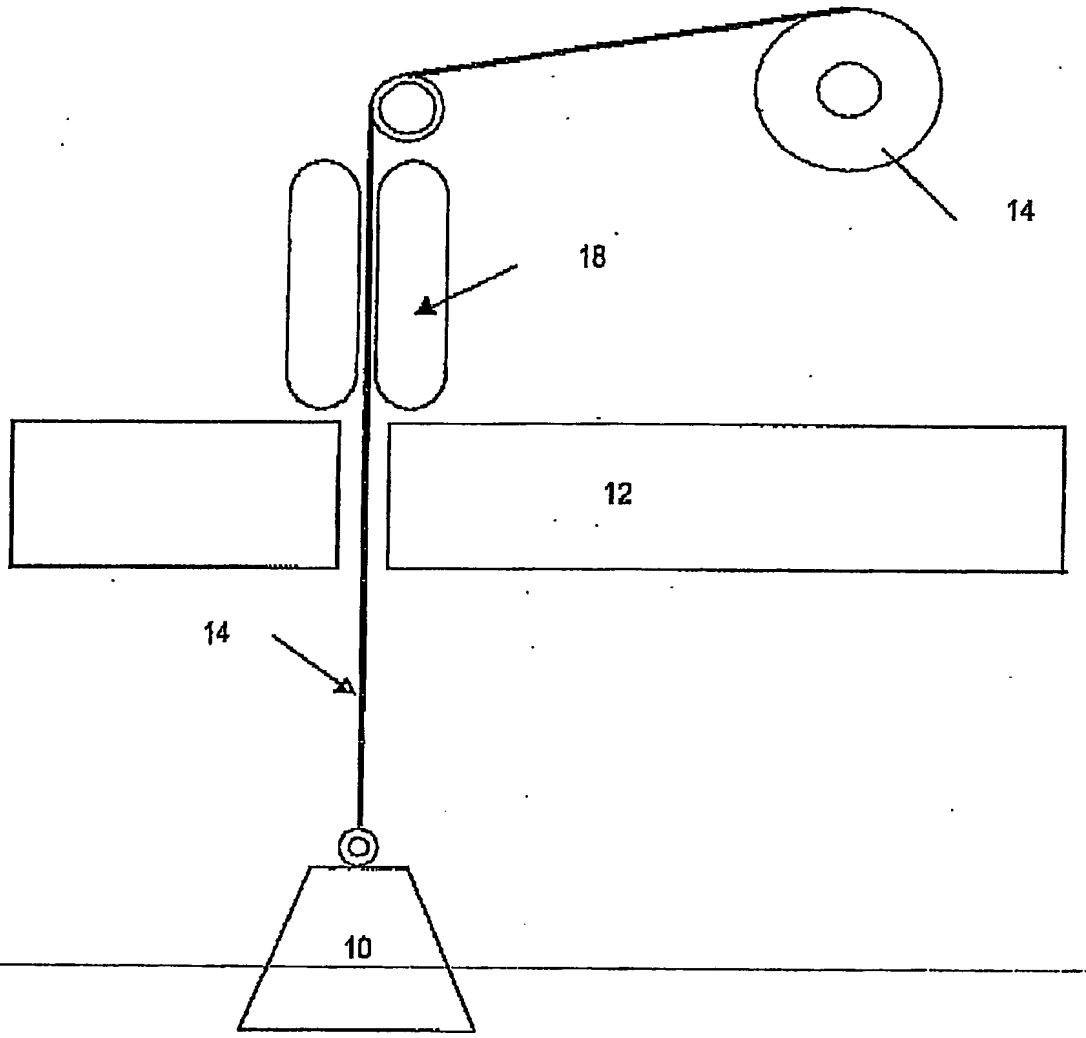

FIG. 1

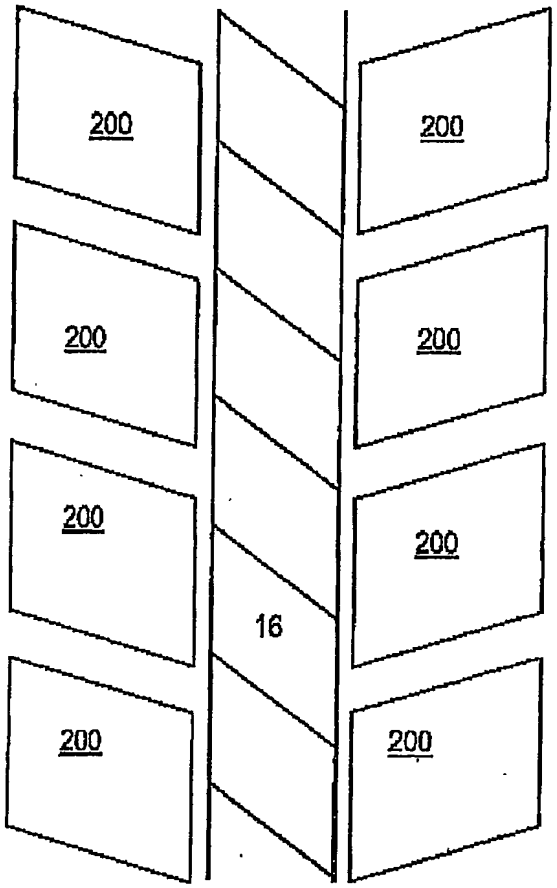

FIG. 2

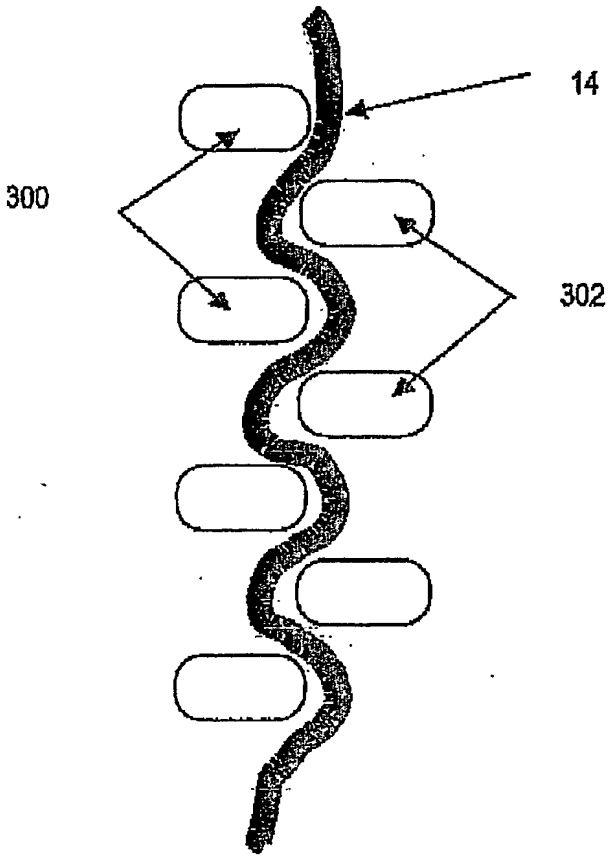

FIG. 3

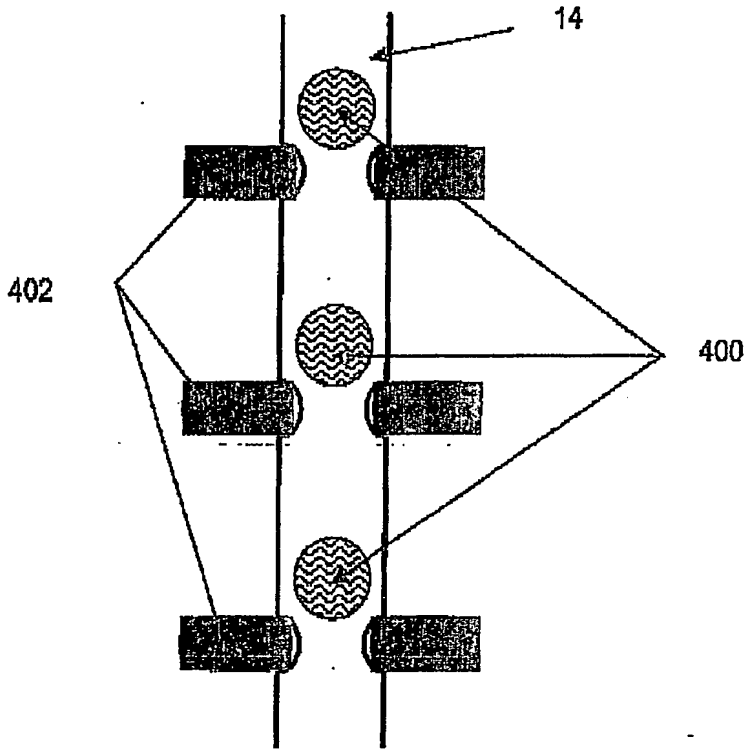

FIG. 4